MARTOF, BERNARD S. 1963. *Leurognathus* and *L. marmoratus*, p. 3. *In* W. J. Riemer (ed.), Catalogue of American Amphibians and Reptiles. American Society of Ichthyologists and Herpetologists, Bethesda, Maryland.

Leurognathus Moore
Shovel-nosed salamander

Leurognathus Moore, 1899:316. Type-species, *Leurognathus marmorata* Moore, 1899, monotype.

• CONTENT. One species (*L. marmoratus*) is recognized; it is confined to streams in the southern Appalachian Mountains.

• DEFINITION. This desmognathine genus alone lacks the premaxillary fontanelle, and has small slitlike internal nares.

• DESCRIPTIONS and DISTRIBUTION. See *Leurognathus marmoratus*.

• ILLUSTRATIONS. See sketches of diagnostic traits in Moore (1899:324) and photographs in Martof (1956 and 1962:6).

• FOSSIL RECORD. None.

• PERTINENT LITERATURE. For a comprehensive survey of the ecology and life history see Martof (1962); for details of the skeleton see Moore (1899) and Hilton (1945).

• ETYMOLOGY. *Leurognathus* is from the Greek *leuros* meaning smooth or even, and *gnathos* meaning jaw, in reference to the flat, smooth palate devoid of a premaxillary fontanelle.

Leurognathus is of either masculine or feminine gender; the Code (see International Commission, 1961: art. 30 [3]) specifies that it be treated as masculine.

Leurognathus marmoratus Moore
Shovel-nosed salamander

Leurognathus marmorata Moore, 1899:316. Type-locality, "south flank of Grandfather Mt., N. C. [Avery Co., North Carolina], and at an elevation of about 3,500 feet." Holotype, Acad. Nat. Sci. Philadelphia 19610, collected by J. Percy Moore, date unavailable.

Leurognathus marmorata marmorata Pope, 1928:14.

Leurognathus marmorata intermedia Pope, 1928:14. Type-locality, "Davis Gap, Waynesville, North Carolina." The type-locality was emended by Bishop (1943:224) to "Davis Farm, about 2 miles east and a little north of Waynesville, [Haywood County] on Highway No. 276." Holotype, Amer. Mus. Nat. Hist. 25557, collected by Clifford H. Pope, 17 July 1927.

Leurognathus intermedia: Pope & Hairston, 1947:160.

Leurognathus marmorata aureata Martof, 1956:2. Type-locality, "Jarrard's Creek, 0.2 of a mile below its crossing of U.S. Route 19, about 9 air miles north-northeast of Dahlonega, Lumpkin County, Georgia; 1,500 feet elevation." Holotype, male, Univ. Michigan Mus. Zool. 111566, collected by Stephen and Andrew Martof, 11 September 1954.

Leurognathus marmorata roborata Martof, 1956:4. Type-locality, "Reed Creek, along Burrell Ford Road, 0.5 of a mile from its junction with Glade School Road, about 3.5 miles northwest of Pine Mountain Community, Rabun County, Georgia; 2,300 feet elevation." Holotype, male, Univ. Michigan Mus. Zool. 111568, collected by Bernard Martof, 18 September 1954.

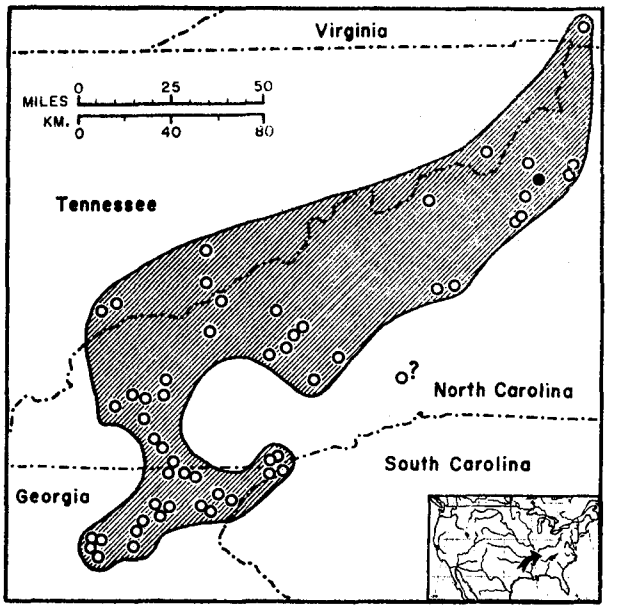
Leurognathus marmorata melania Martof, 1956:6. Type-locality, "Otter Creek, tributary of the Nantahala River, 0.5 of a mile west of Tellico Gap, Macon County, North Carolina; 3,600 ft. elevation." Holotype, male, Univ. Michigan Mus. Zool. 111564, collected by Bernard Martof, 4 September 1954.

Leurognathus marmoratus: Conant, 1958:227. Emendation, see *Leurognathus*, ETYMOLOGY.

• CONTENT. Five subspecies have been described, but these are not currently recognized (Martof, 1962).

• DIAGNOSIS. This large, heavy-bodied salamander is often confused with *Desmognathus quadramaculatus*. *Leurognathus marmoratus* is somewhat smaller, less robust, proportionately longer bodied and shorter tailed, more aquatic, and noticeably less slimy when handled; the tail fin is better developed and the tip of the tail is more obtuse; the head is smaller, both the lateral and dorsal outlines of the snout are more pointed; the nostrils are on a more pointed eminence; and the nasolabial grooves are shallower and more curved. The internal nares provide the best diagnostic feature; in *Leurognathus* these are slitlike openings in a fold on the roof of the mouth, whereas in *Desmognathus* they are conspicuous, rounded openings located in a more mesial position.

• DESCRIPTIONS. Adults attain a maximum snout-vent length of about 78 mm and a maximum weight of 13 grams. There is much geographic variation in coloration and pattern. The dorsum is usually dark brown to blackish; its pattern is dull and variable, usually with two rows of irregular light-colored blotches. Dorsally the U-shaped snout is often the darkest part of the body. The eyes are prominent but small. Typically a light-colored area extends from the eye to the angle of the jaw. Generally this area is not as light as that of *Desmognathus*, but it is clearly evident. Distinctive white specks outline the lateral line organs; these appear as two rows along each side of the body and on the base of the tail. In each row the spots average one per costal fold. They also occur on the head near the jaws and eyes. The color of the venter is highly variable, usually dark grayish with a whitish central area. The tail is relatively long; at the base it is somewhat flattened dorsoventrally, gradually becoming compressed toward the tip. The prominent dorsal keel or fin on the distal ⅔ of the tail is often notched or ragged due to wear associated with swimming amidst rocks. The tip of the tail tends to be rounded. The neck is relatively short, making it seem that the forelegs attach far forward. There are four digits on the forelimbs; in order of increasing length these are 1-4-2-3. The hind limbs are about twice as robust as the forelimbs and possess five digits, 1-5-2-4-3 in order of increasing length. There is no webbing between the digits, the soles of the feet are blackish or dark



MAP. The solid circle marks the type-locality; hollow circles show other selected localities. The question mark represents a doubtful locality.

brown, and the tips of the digits are black. The tail constitutes about 48 percent of the total length throughout life. In snout-vent measurement the males average about 10 percent longer than the females. Head width in males is about 17 percent of the snout-vent length; it is relatively narrower in females. Males tend to lose more vomerine teeth with increasing age than do the females; however, some females lose all vomerine teeth; there is much geographic variation. Sex is best ascertained externally by examination of the vent. In the female the inner walls are lined with regular, smooth folds or plicae. The vent of the male is larger and its walls are lined with numerous, tiny, fingerlike projections or papillae. Moreover, the posterior part of the vent of large males is lined with black pigment. Males can also be recognized by their large maxillary teeth and by the presence of the mental gland located along the midventral surface of the chin.

Eggs: A cluster of 27 to 54 (average 38.1) eggs is laid in June or July generally. Each egg is surrounded by a transparent capsule and has a peduncle by which it is attached to an object, normally the undersurface of a stone in the main current of the stream. A peduncle may also attach to another egg, thus eggs may occur singly or in groups of 2 to 4. The female stays with her eggs throughout the entire period of development, about 2½ months.

Larvae: At the time of hatching, larvae average 11 mm in snout-vent length. At metamorphosis they range from 25 to 38 mm and average about 30 mm. The larvae resemble those of *D. quadramaculatus* but are blacker and more slender. The snout and tail are slightly longer, the legs longer and slimmer, the lips are thinner, and the eyes smaller. The outline of the tail is spatulate, whereas that of *D. quadramaculatus* is much more pointed. The adult dorsal pattern is not readily discernible; however, the dorsolateral light spots usually are visible. In *D. quadramaculatus* these light spots are more medial in position and a characteristic dorsal light pattern is clearly evident. The glistening white gills contrast sharply with the dark body coloration. Light flecks are scattered along the entire side of the body. In *D. quadramaculatus* the only prominent light-colored markings are those associated with the lateral-line system. Another outstanding difference is the nature of the contact between the ventral white and the lateral dark pigment. *Leurognathus* has a sharp line of demarcation, whereas *D. quadramaculatus* has a more gradual blending of ventral and lateral pigments. Both species show considerable variation in the amount of dark pigment reaching forward toward the chin.

Subadults: At metamorphosis the gills are lost, the mouth loses its thick lips, the snout elongates, and the eyelids and nasolabial grooves develop. No detectable changes in body coloration are associated with metamorphosis. The adult pattern and coloration are gradually attained during the first half of the subadult stage. Most individuals are sexually mature when they reach a snout-vent length of 50 mm.

• ILLUSTRATIONS. See the figure and photographs in Martof (1962) for clarification of diagnostic characteristics. Comparisons with early larvae of *D. quadramaculatus* are present in Pope (1924:10), and with late larvae and adults in Martof (1962).

• DISTRIBUTION. The species occurs in southwestern Virginia (Hoffman & Hoffman, 1956) and southward into the Great Smoky Mountains (King, 1944), northeastern Georgia (Pope & Hairston, 1947), and the northwestern tip of South Carolina (Martof, 1956). All stages are thoroughly aquatic.

• REMARKS. Specimens from the Nantahala River drainage, North Carolina, most closely resemble *Desmognathus quadramaculatus*. For a comparison of the ecologic role of *D. quadramaculatus* and *L. marmoratus*, see Martof & Scott, 1957:499.

• ETYMOLOGY. The name *marmoratus* is from the Latin *marmor*, meaning marble, in reference to the marbled dorsal pattern of many individuals.

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